SCIENCE

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SOME INSECT IMMIGRANTS IN OHIO.[1]

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In the following paper the term immigrant is to be understood as given in our lexicons, viz: a species that has come to this State from elsewhere and taken up its permanent abode in our midst. While such species are largely of foreign origin, yet this is not true in all cases, and the term foreign is hereafter intended to apply to territory outside of the State of Ohio. Nor do I intend to enumerate all of the foreign species that have gained a residence within the boundaries of the State, but to give some facts relative to the time, place and method of introduction of a number of them. Without wishing to present a paper on Economic Entomology, it will be necessary to use, as illustrations, injurious or beneficial species, from the fact that these are more closely watched and their movements best understood; but among the earlier known species we find that even these are often difficult to follow in their advance across the country. There are, seemingly, two what we may term gateways through which the majority of species that have come to us from the east, have made entrance into the State, and, later, spread out over the northwest. The first, and apparently the most important one of these, being at the extreme northeastern part, adjoining Lake Erie, and which we might term the north gate, and, second, the valley of the Ohio River, from a point where it begins to form the eastern boundary of the State, southward—perhaps to Wheeling, W. Va. Now, there also appear to be two great national avenues or highways which insect migrations follow; progressing more rapidly along either one or the other, but not equally so along both, and often following only one; the more sub-tropical species, whether American or introduced, taking the southern or what I would call the Great Southwestern route, while the sub-arctic, including, besides American, such species as have come to us from England or Europe north of latitude 45° north, take what I would term the Great Northwestern route. The division between these two great thoroughfares will be indicated, approximately, by a line drawn from New York City, latitude 40° 43′ north, to St. Louis, Missouri, latitude 38° 38′ north, thence to Pueblo, Colorado, latitude 38° 17′ north (about), the line of separation trending northward, east of St. Louis, under the influence of the Gulf Stream and the Great Lakes, chiefly the former. Of course it is not to be understood that this line is direct, as it is doubtless more or less irregular, and, from its very nature, to some extent unstable, nor is it to be supposed to form a radical boundary, as some northern forms gradually work their way south of it, and *vice versa*. Yet it will, I think, be found approximately correct.

One of the first species to push its way across our country was the Angoumoise Grain Moth, *Sitotroga cerealella* Oliver. From the best information we can obtain, it seems to have been introduced into this country from southern France, as early as 1728, occurring at that time in North Carolina. This is a southern species, and it is no way likely that it entered from the north, but found its way into Ohio, where it appeared, probably about 1840, from Kentucky. It has not, so far as I am aware, been observed in any considerable numbers north of the line indicated, but has pushed its way to the southern part of Texas. The wheat midge, *Diplosis tritici* Kirby, which probably came to us from England, via Quebec, Canada, entered the United States through northern Vermont in 1828–29, pushing southward and westward, but seemingly making more rapid progress to the west. This certainly entered Ohio through the northern gateway, over-running the State, as also Indiana. Though reported, first in 1843, and again in 1847, in central Ohio, it was in 1849 reported in destructive numbers along the northern part of the State, while the eastern and southern portions seemed exempt. Therefore, I conclude that it came to the State through the north gate. It is one of the species that has followed both the northwestern and southwestern routes, but has probably made more rapid progress and advanced farther along the former. Of the early movement of the Hessian Fly, *Cecidomyia destructor* Say, in Ohio, I have no exact data. It might have come up from the South, or entered by either of the two eastern gateways. Like the wheat midge, however, it appears to have made more rapid progress north of the line than south of it. The Imported Cabbage butterfly, *Pieris rapæ* Linn., a native of England, but first appearing in this country in the vicinity of Quebec, Canada, in 1860, pushed its way southward, and in ten years had reached southern New York. From here it gradually moved to the west and south, being first observed in Ohio, about Cleveland, in 1873, a year earlier than elsewhere in the State. From this we infer another entrance through the north gate. Though spreading southward, so that the line given does not at present mark the boundaries of its habitat, yet it flourishes best near or to the north of it, and is not nearly so abundant in the Gulf States, though reintroduced into South Carolina in 1873 and in Florida in 1874. It has mainly followed the northwestern route, but, like the wheat midge, its southern boundary lays far south of the line. The three clover insects, *Cecidomyia leguminicola* Lint., *Hylesinus trifolii* Muel., *Phytonomus punctatus* Fab., without exception, I believe, first came to us from the north-east; though the last two are now known to occur in extreme south-western Ohio and south-eastern Indiana. They probably entered the State from the south east by way of the Ohio River, at a later date, there being none continuous of the northern colonies to the southward so far as I have been able to observe or learn. The Phytonomus, two specimens of which were, last spring, found by Mr. Dury near Cincinnati, I feel confident was carried into the Ohio River by some of its smaller tributaries, one of which, Beaver River, rises in north-eastern Ohio, by the exceedingly high waters of last spring, and conveyed down by the current and left along the shores.

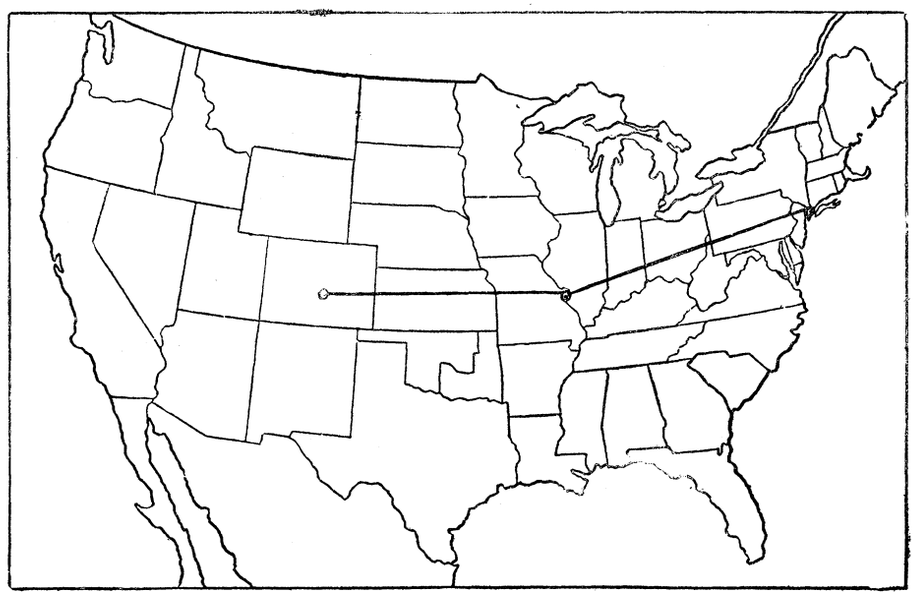
Hylesinus may have been introduced in the same manner, but probably several years earlier, as it has already become abundant enough to prove destructive in Dearborn and Franklin Counties in Indiana.

The Horn Fly, *Hæmatobia serrata* Rob-Desv., probably came first from the north-east, followed almost immediately by an independent introduction by way of the south-east gateway. Coming originally from France, this species, in spreading over our country, does so entirely regardless of the lines we have drawn. Still, its more rapid progress along the southern route, where the facilities for its diffusion are much inferior to those along the northern route, where it has made even less rapid progress, shows that it is swayed by the same influences that have directed the course of other species. So far, we have been dealing largely with species of trans-Atlantic origin. Now we will take an American species—the Locust Borer, *Cyllene robiniæ* Forst. This species had for upwards of a century been known in New York, as an enemy of the Black Locust, *Robinia pseudacacia* L. Some time about the year 1850 it began its invasion westward across northern Ohio, Indiana and Illinois, reaching the Mississippi River about 1865, carrying death and destruction to the Black Locust along its path, but not at once extending its ravages, to a serious degree, in the southern portion of these States. Again, reversing the order of migration that we have been following, we will take another American species, *Doryphora* 10-*lineata* Say.

[1] Read before the Ohio Academy of Science, Dec. 29, 1892.

Starting in Colorado, it pushed its way rapidly eastward to the Atlantic coast, and, though not confined to our north-western route, as we have termed it, nevertheless, its most rapid progress and greatest destruction was executed north of our imaginary line. Even yet it has not spread southward to the Gulf of Mexico.

Another species of whose advance I am not so certain, is *Diabrotia longicornis* Say, described many years ago from examples collected near the foot of the Rocky Mountains, but which I know to now occur in Arizona and Central America. This has become a terrible pest in fields of Indian corn all over the west; and Professor Forbes of Illinois, some years since, expressed the opinion that it was moving eastward. While mentally differing from this opinion myself, yet the fact that it has, this year, been reported for the first time in Ohio, along the western border, has led me to feel that Professor Forbes' opinion may yet prove to be a correct one. Certainly we shall watch and mark its progress carefully. Its congenor, *Diabrotica* 12-*punctata* Oliv., though we do not know it to be of southern origin, yet it is very destructive to the same cereal in the south, but this injury, so far as known, is confined, largely at least, to the territory south of the dividing line, unless it be in Ohio, where, I strongly suspect, it is more destructive than we are aware. Of the south-west route, we have already observed much in relation to such species as have pushed their way over it from the east toward the south-west. Therefore, I shall speak only of such species, with two exceptions American, I believe, as have passed over the ground from south-west to north-east. One of these exceptions is the larger corn-stalk-borer. *Diatræa saccharalis* F.



Map indicating, approximately, the natural divide between the northern and southern insect faunas, east of the Rocky Mountains.

According to Mr. L. O. Howard, who has studied the species quite thoroughly, it may be a native of the West Indies, or it may have originated in South America and made its way to the United States by way of these islands. Be this as it may, it occurs along the Gulf and Atlantic coasts, and, in the light of recent observations, it seems to be pushing its way northward along the Atlantic, having now reached the vicinity of Washington, D. C. Though for years known to infest both sugar-cane and maize, in Louisiana, yet we have no information of a corresponding advance northward. This, in some respects, appears to be the case with another insect, *Cylas formicarius* Fab., which breeds in the sweet potato, a native of Cochin China, India and Madagascar, but introduced into the United States, probably, by way of Cuba. This may have been first introduced either into Florida or Louisiana, as it occurs in both States, and is now pushing its way west across Texas. Whether it will follow in the path of the Diatræa, along the Atlantic, remains yet to be seen. They are both slowly making their way along our great south-western highway, and if either reach Ohio it will most likely be the Diatræa and along our southern border. The Harlequin Cabbage Bug, *Murgantia histrionica* Hahan, is known to occur as far south as Guatemala, through Mexico, and first came to notice in destructive numbers in Texas about 1866. Four years later, it had pushed north to Missouri, and in 1875 it had made its way to Delaware, and on the west occupied wholly or in part Arizona, Nevada, California, Indian Territory and Colorado. It is now found in extreme southern Illinois, Indiana and Ohio, in all cases, I believe, near the dividing line between the two routes, also in New Jersey, thus covering almost exactly the south-western highway, but, excepting, perhaps, in the far west and near the Atlantic, not extending far beyond it. Although an older established species, *Dynastes tityus* Linn. occupies almost exactly the same area except in the extreme east, where Dr. Lintner has recorded it at Kingston, some seventy miles north of New York City. To my personal knowledge it breeds in southern Illinois, and also at Bloomington, Indiana. I have found it at Columbus, Indiana, and have good evidence of its occurrence in the vicinity of Columbus, Ohio. It has been known from southern Pennsylvania, and, later, from New York. Of the Bag or Basket-worm, *Thyridopteryx ephemeræformis* Haw., also a southern species, I only know that it breeds in southern Illinois, Indiana, and in Ohio, a short distance north of Hamilton, Butler County, while under Atlantic influences, it is sometimes abundant as far north as New York and found also in Massachusetts. The Praying Mantis, *Stagmomantis carolina* Linn., breeds in extreme southern Illinois, and also in extreme southern Indiana, but is said not to do so in Ohio. I have a male, given me some years since by Professor S. S. Gorby, State Geologist of Indiana, that was captured in a railway coach, running between Cincinnati, Ohio, and Indianapolis, and was captured between the latter city and Dayton, Ohio. I also learned that this summer a female was captured in Indianapolis, by which I judge that these two southern species are hovering in the vicinity of our boundary line.

As before stated, we have used as examples species of economic interest, only for the reason that their movements are better understood. A careful study of the geographical distribution of other species would, doubtless, throw more light upon the problem. Our dividing line is supposed to be correct only in a general way, as, of course, there can be no such thing as an exact or continuous line of demarkation. This will of necessity be more or less irregular. Again, a species spreads over an area

particularly adapted for its occupancy. But, no sooner is this done than the individuals along the frontier begin to adapt themselves to an environment but slightly unfavorable, and, as their adaptation changes, so do they slowly advance outward from the territory originally occupied. A series of unfavorable seasons might occasion the occupation of a wide margin of adjoining country, while a series of unfavorable seasons might sweep this tide of advance back to the place of its origin. But, as the receding tide of the ocean leaves many pools of water in the depressions of rock, so will there be left, in especially favorable nooks, a few of the insects which will retain their hold and form small, local colonies, of perhaps not more than a few individuals, and the offspring of these will meet the investigator long distances from the real habitat of the species. There is scarcely a collector who does not know of one or more small, secluded areas, in his neighborhood, that are rich in varieties, and which he seldom visits without satisfaction, and frequently he is astonished at his success. How long this ebb and flow has been going on, and how many species have been brought to us in this way, are problems we are yet unable to solve. Therefore these facts have been brought together, and are here presented, not as a finished, nor, indeed, as an advanced study, but rather as a primary outline, to be revised and modified as our knowledge of the geographical distribution of our species shall be enlarged by additional study and research.

A SKELETON OF STELLER'S SEA-COW.

BY BARTON W. EVERMANN, PH.D., ASSISTANT, DIVISION OF SCIENTIFIC INQUIRY, U S. FISH COMMISSION.

DURING the time from March to September of last year the U. S. Fish Commission steamer "Albatross" was engaged, under the direction of the State and Treasury Departments, in making investigations regarding the habits, distribution, and abundance of the fur seal in Bering Sea and the North Pacific Ocean; and it was my good fortune to accompany the vessel as senior naturalist.

While carrying on these investigations, we had occasion to visit the Commander Islands, situated in Bering Sea, off the coast of Kamchatka about 80 miles. We spent the first week of June on or about these islands, and in this article I wish to call attention to one of the most interesting and valuable results of our visit to Bering Island, the more important one of the group. This was no less than the discovery of a nearly perfect skeleton of the now extinct Steller's sea-cow, *Rytina gigas*.

This remarkable animal was first discovered in the fall of 1741 by Captain Vitus Bering when his ship was wrecked upon the island now bearing his name. Geo. W. Steller was the surgeon and naturalist of Bering's party, and it is to him that we owe about all that we know about the sea cow in life.

At the time of its discovery this large marine mammal was quite abundant about Bering Island, as Steller reports that he saw them in great herds feeding upon the kelp and other sea-weeds that grow in abundance in the shallow water about the island. It was soon discovered that the flesh of the sea-cow was good eating, and the men killed many of them for food.

According to Steller, the sea-cow when fully grown was 24 to 30 feet in length, 20 feet in girth, and weighed 6,000 to 8,000 pounds. It was of a nut-brown color and covered with hair, matted like the outer bark of a tree. The skin was exceedingly thick, and so tough that the hunters had to cut it with an ax. The head was very small when compared with the great size of the body, the jaws were toothless, but were furnished with a thick, horny pad. The anterior limbs were modified into flippers, while the hind limbs were entirely absent, and the tail was widely forked, as in the sperm whale.

This animal was gregarious, stupid, sluggish, and comparatively helpless, being unable to protect itself by diving, and was occasionally washed ashore by breakers.

When, in 1743, the news of the discovery of Bering Island reached Kamchatka, several expeditions were fitted out for the purpose of hunting the sea-cow and the various fur-bearing animals, such as the sea otter, fur seal, and blue fox, which are found there; and very soon many whaling vessels began to stop there to lay in a supply of sea-cow meat for food. So great was the destruction wrought by these whalers and fur-hunters that by 1754, only 13 years after its discovery, the sea cow had become practically exterminated. In 1768, according to the investigations of Dr. L. Stejneger of the National Museum, who has made a most careful study of the question, this large and important marine mammal became wholly extinct, the last individual ever seen alive having been killed in that year; and the fate which overtook Rytina so speedily has almost become that of the buffalo, and will as certainly become that of the fur seal unless it be protected.

Mr. Frederic A. Lucas of the National Museum has recently published a most interesting and valuable paper on "Animals Recently Extinct or Threatened with Extermination," in which he gives in readable form about all that is known of the sea-cow. In this paper, of which I have made free use in the present article, Mr. Lucas states that, up to 1883, but two skeletons of the sea-cow were known. One of these is in the Imperial Museum at St. Petersburg, and the other is in the Imperial Academy of Helsingfors. There are two ribs in the British Museum. During Dr. Stejneger's stay of about two years (1882–1883) upon Bering Island, he succeeded in finding a number of skulls, ribs, vertebræ, and other bones. One complete skeleton was found buried in the sand, but the bones were too far decayed to permit handling. From the various individual bones found by Dr. Stejneger a fairly good skeleton was "made up," which is now in the National Museum. This, together with the two skeletons at St. Petersburg and Helsingfors, and the two ribs in the British Museum, constituted the total amount of material pertaining to Rytina found in the museums of the world at the time of my visit to Bering Island.

Being conversant with these facts, imagine my surprise and delight upon learning, soon after landing, that a native had recently found a nearly perfect skeleton in a good state of preservation, and that he would sell it. I took the first opportunity to examine the skeleton, and was not slow in deciding that it should be purchased for our National Museum. This skeleton was found in 1891 by the same native who found the one which was sent to the Czar. It was embedded in the sand to a depth of a few inches, and lay several rods from the present water-line. It is in a good state of preservation and proves to be very nearly complete. The cervical vertebræ are complete and show that the number is seven instead of six a point that was in dispute until settled by the study of this skeleton made by Mr. Lucas of the National Museum.

Unfortunately the anterior limbs are incomplete, and whether Steller's sea-cow had any hand or finger bones must still remain an unsettled question.

PLANT DISEASES, CAUSED BY NEMATOID WORMS OF THE GENUS APHELENCHUS BAST. I.

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BIS vor kurzer Zeit waren blos aus den Nematoden Gattungen *Heterodera Gruff* und *Tylenchus Bastian* in Pflanzen schmarotzende Arten bekannt; in den letzten drei Jahren gelang es mir drei neue, bisher unbeschriebene Species aus der Gattung *Aphelenchus Bastian* als die Ursache von Pflanzenkrankheiten zu entdecken.

Bekanntlich sind die *Aphelenchen* den *Tylenchen* nächst-verwandt; es sind beide aalförmige Anquilluliden mit schwach geringelter Cuticula und mit einem Mundstachel hinter der Mundöffnung zum Durchbohren von Zellwänden. Während aber bei *Tylenchus* der Darm in der halben Länge des Oesophagus eine kugelförmige oder ovale muskulöse Auschwellung (den "Muskelmagen") besitzt, und nachher am Hinterende des Oesophagus eine nochmalige Auschwellung (den "Magen"), findet sich bei *Aphelenchus* wohl das erst genannte, nicht das zweite Organ, sodass der eigentliche Darm unmittelbar hinter den Muskelmagen anfängt. Es haben weiter die Männchen der *Tylenchus-*

arten eine Bursa, welche den *Aphelenchus*-arten fehlt (Vgl. 2B. Bastian, "Monograph of the Anquillulidæ," in Transactions of the Linnean Society, xxv., S. 122–124; auch de Man, "Die frei in der reinen Erde und im süssen Wasser lebenden Nematoden," S. 137).

Aus dem Genus *Aphelenchus Bastian* waren bisher 10 Arten bekannt; es wird aber wahrscheinlich herausstellen, dass mehrere dieser Arten unter sich identisch sind. Es wurde von diesen 10 *Aphelenchus*-arten *Aphelenchus Avenæ Bastian* zwischen den Blattscheiden und dem Halme von Haferpflanzen, *A. villosus Bast.* in Moosrasen, *A. parielinus Bast.* in Flechtenkrusten gefunden; ich finde aber keine Mitteilung darüber ob die beiden letztgenannten Arten als Schmarotzer in den Moosen resp. Lichenen, oder vielmehr *zwischen* den Blättern resp. den Teilchen des Thallus, lebten. Auch über irgend welche von *A. Avenæ* verursachte Pflanzenkrankheit findet sich bei Bastian gar keine Mitteilung, sodass bis jetzt unentschieden bleibt, ob diese *Aphelenchus*-species als wirklicher Pflanzenschmarotzer angesehen worden muss oder vielleicht blos zufällig in einer Haferpflanze gefünden wurde.

Ich habe bis jetzt drei *Aphelenchus*-species entdeckt, die zweifelsahm wahre Pflanzenschmarotzer sind, und von denen die eigentümliche von ihnen hervorgerufene Pflanzenkrankheit von mir studiert wurde. Es sind die folgenden Arten: *Aphelenchus Fragariæ nov. spec.*, *A. Ormerodis nov. spec.* und *A. olesistus nov. spec.* Eine Beschreibung dieser drei Arten will ich hier nicht geben; die ersten zwei Arten wurden schon von mir in Sorasier's "Zeitschrift für Pflanzenkrankheiten" (Bd. I.. S. 7, 1891) beschrieben und abgebildet; die letztgenannte Art wird bald im dritten Bande derselben Zeitschrift ihre Beschreibung finden.

Aphelenchus Fragariæ fand ich in eigentümlich erkrankten, aus St. Paul's Cray, Kent (England), herkömmlichen Erdbeerpflanzen; es erkrankten auf einem Felde von 14 Acres etwa die Hälfte der dort wachsenden Pflanzen. *Aphelenchus ormerodis* wurde von mir in kranken Erdbeerpflanzen gefunden, die mir aus Erith (Kent, England) zugingen. Für diese beiden Arten verdanke ich das Untersuchungsmaterial der freundlichen Bemittlung Miss Ormerod's aus St. Albans, England, der zu ehren ich die eine Species benannt habe. *Aphelenchus olesistus* erkannte ich als die Ursache einen sehr typischen Erkrankung von Begonien-blättern, die mir Herr Dr. Masters (London) zugehen liess, sowie einer dergleichen Erkrankung von *Asplenium bulbiferum* und *diversifolium*, welche mir Herr Dr. Klebahn in Bremen zusandte.

A. Die von Aphelenchus Fragariæ verursachte Erdbeerpflanzenkrankheit. Dieser Nematode lässt im allgemeinen dieselben Abnormitäten bei der Erdbeerpflanze auftreten, welche die anderen Nematodenarten verursachen, wenn sie in Pflanzengeweben schmarotzen, nämlich eine Einschränkung resp. ein Stillstehen der Längenwachstums der Gefässbündel, gewöhnlich eine ungemein starke Verästelung derselben,— Hypertraphie der Parenchymzellen der Stengel, Aeste und Blätter,—starke Teilung, zuletzt Absterben dieser Zellen. Es versteht sich, dass dem Habitus nach sehr verschiedene Missbildungen entstehen, je nachdem eine Pflanze oder irgend welcher Pflanzenteil früher oder später von Parasiten heimgesucht wird; und je nachdem sich in demselben eine grössere oder geringere Anzahl von Anquilluliden befindet.

Bei den von vielen *Aphelenchen* bewohnten Erdbeerpflanzen findet sich eine starke Verdirbung aller Stengelteile und eine starke Verästelung sowie die Bildung einer grossen Anzahl neuer Knospen. In den Achseln der niedern, normal entwickelten Blätter finden sich zahlreiche, sehr dickschuppige Knospen, welche eine grosse Uebereinstimmung haben mit den kleinen Brutzwiebeln, welche sich innerhalb der ausgewachsenen Zwiebeln bilden; diese abnorm dicken Knospen bilden niemals Stolonen. Der Hauptstengel ist bei einigen Exemplaren anfänglich ziemlich regelmässig ausgewachsen (wahrscheinlich weil die Pflanze nicht sogleich von einer grossen Anzahl von *Aphelenchen* bewohnt wurde); aber in einer gewissen Höhe verästelt er sich stark; die Aeste find nicht nur dick und breit, sondern bleiben während ihres weiteren Wachstums auf eine grosse Strecke ihrer Oberfläche hin vereinigt, sodass wahre *Verbänderungen* ("*Fasciationen*") entstehen. Es bilder sich aber gewöhnlich keine bandförmige Stengelform, sondern eine Verdickung, welche sic am besten mit einem Stücke Blumenkohl vergleichen lässt, weshal ich — in Uebereinstimmung mit Miss Ormerod — die von *Aphe lenchus Fragariæ* verursachte Krankheit "die *Blumenkohlkrankhei* der Erdbeerpflanze" ("*Cauliflower disease*") genannt habe. I einigen Fällen aber bildet sich eine einfache, bandförmige Ver breiterung, also eine wahre Verbänderung des Stengels resp. de Astes, während die an derselben befindlichen, immer sehr zahlreichen Blumen, oder Blattknospen, mehr oder weniger normal zür Entwickelung kommen.

Bisweilen auch ist das Wachstum auf der einen Seite des Stengels oder des Astes, welcher eine Verbänderung bildet, kräftiger als auf der anderen Seite; es entsteht infolge dessen eine Biegung des betreffenden Teiles, welche sich so sehr steigern kann, dass letzterer sich ganz zusammenkrümmt. Oft teilt der Gipfel des Fasciation sich wieder in eine grosse Anzahl verschiedener Aeste, welche mehr oder weniger normal entwickelte Blüten und Blätter tragen.

Allein am meisten kommt es vor, dass der Stengel oder der Ast sich nicht nur in die Breite sondern auch in die Dicke vergrössert; die Seitenäste verwachsen entweder zum grössten Teile oder gänzlich mit einander, und die Knospen kommen nur ausnahmsweise zu vollkommener Entwickelung. In diesem Falle ähnelt ein grosser Teil der kranken Pflanze sehr dem Blumenkohle oder dem Broccoli, je nachdem die Knospen entweder gar nicht oder doch noch teilweise zur Entwickelung gelangen und normale oder abnorme Blüten entstehen lassen.

Bisweilen bleibt der Stengel sehr verbreitert und kurz, und sind die Knospen an seinem Gipfel, oder vielmehr an seinem Kamme, zusammengedrängt, wie beim Hahnenkamme (*Celosia cristata*); bisweilen zeigen letztere sich auch an den Seiten des Achsenteiles, und zwar infolge des unregelmässigen Wachstums, sehr unregelmässig verbreitet, oft in grosser Anzahl dicht zusammengedrängt, eine bedeutende Oberfläche einnehmend. Gewöhnlich aber finden sich die Knospen, ganz wie beim Blumenkohl, auf dem grössten Teile der Oberfläche der zu einer dichtgedrängten Masse veränderten Achsenteile. Die Aehnlichkeit mit Blumenkohl kann wirklich eine sehr grosse sein.

Von den Blättern der von *Aphelenchus Fragariæ* heimgesuchten Pflanzen sind gewöhnlich zwar einige normal; viele aber bleiben immer klein, wobei die Blattfläche verhältnismässig kleiner bleibt als der Stiel; bisweilen ist die Blattfläche nicht mehr dreizählig sondern aus einen Stücke bestehend; auch ist sie oftmals gefaltet.

Die Blütendeckblätter sind gewöhnlich klein, oder sie sind zwar kürz, aber dick und unregelmässig gefaltet.

In Betreff der Blütenknospen bemerke ich folgendes: Bisweilen ist der Achsenteil sehr dick und bleiben die Blatteile sehr-dünn, schuppenförmig. Bisweilen werden die Blatteile zwar dicker, bleiben aber nichtsdestoweniger kurz und behalten den Habitus von Schuppen. Oft sind dann die beiden Blätterreihen des Kelches ("Calyx duplex") vollkommener als die anderen Reihen von Blütenblättern entwickelt. Oefter bleibt die Knospe ganz oder fast ganz geschlossen; in anderen Fällen aber öffnet die Blütenknospe sich.

Die äusserste Blätterreihe des Kelches besteht oft aus dünnen, schmalen, sogar nadelförmigen Blättchen. Die Blätter der inneren Reihe kommen gewöhnlich.weit mehr zur Entwickelung; sie sind oft mehr oder weniger gefaltet und bisweilen an der Unterseite blasenförmig augeschwollen. Oft sind sie mehr oder weniger gelappt, gespalten oder eingeschnitten; sie können auch dreizählig sein und also die Form der gewöhnlichen grünen Blätter nachahmen.

Die Kronenblätter bleiben oft ganz rudimentär. Bisweilen kommen sie zwar zu weiterer Entwickelung, bleiben aber kleiner als die Kelchblätter, biegen sich hin und her und falten sich; sie sind dann aber nicht weiss, wie die gesunden Kronenblätter, sondern grünlich weiss bis hellgrün, allein dünn und zart wie die gewöhnlichen Kronenblätter.

In vielen Blüten fehlen die Staubblätter oder sie sind rudimentär; bei anderen Staubblättern ist der Staubbeutel normal, der Faden aber dick und kurz.

Der Blütenboden, d. h. der Achsenteil der Blüte, mit den auf demselben eingepflanzten Pistillen, bleibt in vielen Fällen sehr

klein; letztere können auch gänzlich fehlen. Bisweilen entsteht eine anilläre Prolification der Blüten, und zwar immer in der Weise, dass in den Achseln von zwei bis drei Kelchblättern sich neue Knospen bilden, aus denen aber wohl niemals normale Blüten entstehen.

Uebrigens versteht es sich von selbst, dass an den weniger heimgesuchten Pflanzen auch ziemlich normal entwickelte Aeste, Blätter und Blüten vorkommen.

Die von *Aphelenchus ormerodis nov. spec.* und *A. olesistus nov. spec.* verursachten Pflanzenkrankheiten werden in der zweiten Abteilung dieses Aufsatzes beschrieben werden.

BURIED ALIVE, — ONE'S SENSATIONS AND THOUGHTS.

BY WARREN K. MOOREHEAD, 5215 WASHINGTON AVE., HYDE PARK, CHICAGO.

THE title of a paper written for *Science* — "Buried Alive" — seems rather sensational, and, so far as the title goes, the article might be more properly published in one of the daily newspapers. I have made bold to write upon an unpleasant experience of the year 1888 at the suggestion of several friends interested in studying suspended respiration. They have told me that cases of complete burial in earth (the subject being conscious meanwhile) where the person "interred" escaped with his life and was able to give a satisfactory or intelligent account of his feelings, are extremely rare. They suggested that, as my accident would furnish material for consideration among medical men interested in kindred studies with themselves, it had better be described.

A mound was being excavated near Frankfort, Ross County, Ohio, in August. At the centre the wall (from the base-line upwards) was fifteen feet high. It was undermined by the workmen, and, as I bent down to examine a small bone uncovered in the process of undermining, a mass of earth equal to several cartloads suddenly dropped from above.

There was no one in the excavation, the men having gone on top preparatory to cutting down the undermined wall. As the earth cracked loudly, I looked up and started to rise. The falling mass knocked me back about five feet, so that I fell with my head and shoulders resting upon a heap of loose earth. The falling wall was, of course, seen only for an instant. It looked black, and the rush of wind it caused I well remember. My head and shoulders were somewhat higher than my legs, possibly a foot. The feet were spread apart. There was little pain, only pressure, *intense pressure*. It forced the buttons of my light field costume partly inside the flesh; my watch-chain left a bright-red mark along my left side. I could feel the watch strongly pressed against two ribs (these were broken). The skin over my forehead seemed being cut, but it was the pressure of my hat forcing the flesh between the laced straws. A knife in my pocket seemed burningly hot. Just under the small of my back lay a large clod. The pain at the point of contact was considerable at times, and my spinal column seemed slowly breaking. Then the pain stopped and I could feel nothing.

Thoughts coursed like lightning,— past life, future, and home. I did not think much of the situation, except to wonder if I could breathe when I got out. One singular thought occurred. I remembered reading of women who, in war times, buried their husbands in ash piles or sand-heaps to prevent their being drafted into the army. I had often wondered if it were possible for one so placed to breathe through a tube, as described in the stories. I remember trying to move a hand, even a finger. One could not have been more firmly held in a mould. My arms and hands were perfectly motionless. The chest could not be inflated or moved the slightest distance. On the contrary, the downward pressure forced all the air out of my lungs. I remember how hot the earth against my face became as the last breath was forced from me. Just in front of my mouth and chin was a slight hollow, formed by the arching of two good-sized lumps of clay. I could move my chin and open and shut my mouth. That was the only part of my entire body that could be moved. I remember trying to keep my mouth shut to keep out the dirt. But after a few seconds my mouth instinctively opened, and, the arch having broken down, earth filled it. I remember the horrible sensation of trying to dislodge the earth and the fear of strangling that suddenly seized upon me. I then felt that I was doomed to perish, but had no fear and did not particularly care.

It was sixty seconds, so the surveyor says, when the men reached my head. The laborers think it was over a minute, but I am inclined to believe the surveyor. I felt the earth move slightly above my head. That gave me hope. I had not thought much of rescue, but I gathered my remaining strength. A shovel passed across the top of my head, cutting the scalp; I remember feeling it as if a hot iron had struck me. Then they uncovered my head and removed the earth from my mouth and eyes. For some unaccountable reason they stopped for an instant. The surveyor says the pressure was so great upon the imprisoned portions of my body that the blood was forced to the head, and the veins stood out so strongly he feared they would burst. Even with the head uncovered I could not breathe. They soon had me laid outside upon some wheat sheaves. I remember, just as they carried me out, seeing a little yellow "wild canary" perch upon a tall thistle near at hand. I heard it sing a sweet song. As the bird flew away, I seemed to follow it, dancing about the fields, perching upon this and that shrub, just as it did. The sky seemed to have a different color from that usually noticed, I was impressed with its grandeur,— the scenery of the surrounding country was remarkably beautiful, and as I observed all these things they affected me, and I cried.

They rubbed my limbs, I could see the men at work, but could feel nothing. The partial paralysis of my limbs continued for some days. To some extent the accident has affected my mind. I cannot now enter an underground cave, or mine, or stand under an overhanging bank without an effort; it requires all my will to go in them. I also often dream of caving banks and experience precisely the same feelings as I did in reality. I neglected to state that the earth above my head was about three feet thick, that over my legs was much deeper. Many persons buried in gravel pits and in earth not nearly so deep have been taken out dead.

NOTES AND NEWS.

IN a letter to Dr. Charles S. Minot the method used by Dr. M. von Lenhossék to obtain his remarkable results on the nerves of earth-worm, is described as follows: The method cited by me corresponds to Golgi processo rapido: Pieces of an earth-worm, each three-quarters millimeters long are placed for three to five days in about ten cubic centimeters of the following mixture: Bichromate of potasssium, 3.5 per cent, four parts; perosmic acid, 1 per cent, one part. The pieces are then dried off with filter paper, and placed for about forty-eight hours in the second solution of 0.75 per cent nitrate of silver, to every two hundred cubic centimeters of which one drop of formic acid is added. As soon as the pieces are placed in the second solution a reddish brown silver precipitate is thrown down upon their surfaces; the success of the method depends upon this precipitate being formed in the interior of the tissues also. The pieces after this treatment must be hardened rapidly in absolute alcohol (probably a large quantity of 96 per cent alcohol will act equally well), and are then imbedded in elder pith and cut with the microtome. If the reaction has been successful, the nerve-fibres and the cells from which they spring will show the well-known and characteristic Golgi coloration (almost black owing to the silver deposit). If the first attempt at the reaction fails, the coloration may be often obtained by repeating the sojourn in the two liquids as above directed. But even after double treatment the reaction is often not accomplished, but when it succeeds it amply repays all the trouble and vexation it causes. The sections must be mounted at once in Canada Balsam dissolved in xylol (or benzole), and left without a cover-glass. (In the second volume of the "Anatomische Hefte" a method is described by which Golgi preparations may be made so permanent that they may be mounted with a cover glass.) It is by means of this method that Lenhossék made the discovery that the sensory nerve-fibres arise from the sensory cells of the epidermis and branch in the same manner as in vertebrates, forming within the central nervous system a branch running tailward and another running headward.

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Attention is called to the "Wants" column. It is invaluable to those who use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

THE RELATION OF ALIMENTATION TO SOME DISEASES.[1]

BY JAMES WOOD, M.D, BROOKLYN, N.Y.

THE general statement that one has partaken for a considerable time of an incorrect diet gives the impression, and true, that the body generally is affected, and nowhere is this more strikingly seen than when acute disease attacks an organism whose habit of feeding has been faulty. We have therefore the salient thoughts that improper food induces abnormal functional performance, which by continuance becomes organic; that an improper diet lessens the chances of recovery from acute and chronic conditions, and that improper alimentation prolongs convalescence from disease processes and predisposes to a diminished vitality.

The thought of first importance, however, is, To what extent does disease depend on alimentation? This is answered by considering the subject of the relation of health to alimentation. As a usual condition we each had given to us at birth a body very well suited to continue to exist if properly nourished. Any hereditary influence, with the exception of a few instances, is merely a decrease in the complement of vitality. What is meant by that is best illustrated in the case of consumption. It is a very common error to hear both the profession and laity remarking that consumption is hereditary. This we dispute, and on the best of grounds consider the one factor of the three, a lowered vital tone only as being transmitted. This lowered vitality being so often dependent on transmission makes the consideration of what food should be partaken of by progenitors of the race their most important thought if we desire to give to our offspring a constitution capable of withstanding the adverse influences met with in life. This can be done only by using a diet whose quantity and quality bear a proper relation to each other. Why you ask? Because the single cells and their sum the body does not remain in an unchanged condition: there are two great phenomena constantly taking place in each individual cell. Nature calls for such a quantity of proteid matter as, when appropriated by the organism, will meet the daily nitrogenous expenditure as shown by the excretion of the normal amount of urea. The intake of oxygen and food meets the demand on the part of the various cells for nutritive pabulum to carry on the anabolic or constructive processes of the body.

The second phenomenon commences with combustion or oxidation, and passes through a long series of destructive or katabolic phases to the formation of nitrogenous metabolites, "and this process is carried on in an organism with an activity which is dependent on the activity of the living substance itself, and on the quantity of material supplied to it."

The discharge of these products of katabolic metabolism is termed excretion. From a study of these we are enabled, as it were, to glance back over the whole series of vital processes and ascertain in which one there exists an abnormality.

To continue in perfect health, therefore, such food products must be partaken of which shall insure the perfect functional workings of the body, supply elements to carry on vital action and give material to build up degenerated tissue, or, to be more general, we must supply each day the needs of the body which have been brought about by its activity. More than this quantity or such as is improper in quality will act as a deleterious agent and destroy to that extent vitality. The subject of the use and misuse of vitality is very large, and we must, to be brief, consider it as an element whose quantity is limited, depending largely on the physical condition of our ancestors. We have such a proportion given us as will, with proper care, last us for the natural allotment of years. To misuse it means succumbing to disease before our time, just as the athlete by the expenditure of such a large amount of vitality each day in the perfect training of his muscular organs uses more than can be formed for any length of time by the transforming powers of the organs of digestion. When these become used up then he, of necessity, must die. Had these organs been the study of successive generations, the standard of their power to produce vitality could have been raised and physical and mental vigor prolonged and increased.

As we have before stated, there must exist an equilibrium between production and destruction if we will have perfect health. The condition of production is dependent solely on the quantity and quality of the food; and when we consider that the whole process of animal life is a constant metamorphotic progression, only limited by the varied isomeric forms which the nutritive elements are capable of assuming under the pressure of organic influences, we are capable to some extent to appreciate what a great influence the nature of the nourishing bodies must have on a continued normality.

If we use up a large part of the oxygen of the body by oxidizing a diet composed largely of the starches, sugars, and fats, we will have but an insufficient amount left for the complete transformation of the food ingested into its kenitic or final products. It was shown in an article written for Merck's Bulletin of last year that these products of suboxidation of the proteids belonged to the most poisonous agents of which we have any knowledge, i. e., ptomaïns, leucamaïns, etc. The absorption of these products of but partial oxidation, leads to a profound state of malnutrition, with all its accompanying symptoms and sequelæ.

Jaksch, in his investigations, found that in anæmia the precursors of uric acid in the blood united in that fluid instead of the renal epithelium, so greatly were the functions of the body at fault.

Is it not evident in this condition that we have a frequent source for the derangements of bodily action and disease?

By the suboxidation of the proteid food-stuffs from the ingestion of large quantities of the corbohydrates, which is the general evil, we have another cause or predisposing factor besides the ptomaïnic poisoning to a certain distinct line of abnormal conditions.

If the quantity of food ingested is too large, we have, from the inability of the system to transpose such a large bulk completely, the same conditions as above, or a quantity beyond what nature demands exhausts the limited oxygenating capacity of the blood and causes the appropriation of that oxygen which should go for the complete transformation of the more difficult nitrogenous compounds. Thus, from an incomplete oxidation of these latter compounds, we get but partial metabolic changes; derangement of the organs of secretion and excretion rapidly follows, which in turn gives products antecedent to perfect metamorphosis, and the final result is a systemic poisoning.

Thus we see if a larger quantity of food is eaten than can be perfectly oxidized in the body, and especially if the starches, sugars, and fats be in preponderance, imperfect results of general bodily oxidation must take place. If this supra-feeding should continue for a certain time, with its resultant incomplete products, a devitalization of the protoplasmic elements of the hepatic cells occurs, with serious deterioration of the most important func-

[1] A portion of a paper read before the regular meeting of the New York Academy of Anthropology, Jan. 17, 1893.

tions of the liver and kidneys. In consequence of these abnormal changes in such important organs and the decrease in the oxygenating capacity of the body, a host of incomplete katabolins is developed and retained to a large extent within the organism.

The fact becomes very prominent, therefore, that much of the ill-health and almost all of the cases of uricæmia can be traced to the universal habit of over-eating. A strong healthy individual whose life is spent entirely in the open air and at vigorous work can ingest greater quantities and varieties of food than is necessary to supply to the system the requisite amount of nutrition and energy, without suffering much from the indulgence. If the stomach does not reject this burden at once it is largely taken care of by the system. When the varied capacity in different persons for storage is exceeded, the organism balances the accounts by a period of vomiting and misery incident to a bilious attack. After middle life these attacks may become less frequent and the excessive amount of food is changed into fat and the individual becomes more corpulent, providing a facility for converting elements into fat is consistent with the constitution of the organism. Some people seem incapable of storing fat however rich the diet or sedentary their habits, and as this oversupply of nutritive pabulum must go somewhere, we find that it is but partially used by the system and the larger part exists in the organism as irritating elements, becoming a most potent factor in inducing functional derangement of the liver and other organs or manifesting itself as gout, rheumatism, diabetes, etc. In persons whose occupation keeps them in illy-ventilated rooms for long periods and whose general system is consequently in a devitalized condition, nature is not so kind, but jumps at once to the more serious complaints.

The perfect performance of no functions is probably so important as those of the liver and intestines. They both lie at the gateway to the system, and if by improper food they are deranged damage must follow.

One of the most important functions of the liver is to prevent the entrance into the general system of those poisonous agents above referred to.

When we recognize the fact that all forms of extraneous and poisonous substances which are introduced into or are developed within the system "are carried to the liver, and there acted upon by the chemico-physiological transforming power of the protoplasmic masses composing the cells of that organ, it is quite easy to see and comprehend how derangement, faulty action, or even an absolutely pathological condition, of these cells is developed" Any one of these three conditions will disturb normal action on the part of the liver, and will tend to derange one of its most important functions, that of bile formation — a function upon which the whole matter of digestion and assimilation are dependent. This is very evident when we consider that the greater part of the digestion of the food-stuffs takes place in the intestinal canal. On imperfectly formed biliary fluid on reaching the alimentary canal will be unable to perform those functions delegated to it by nature, such as the emulsification of neutral fats, conversion of starch and glycogen into sugar, exciting contractions of the muscular coats of the intestines and assuring an evacuation of its contents, stimulation of the muscles of the villi, which empty the nutrient sacs into the lacteals, exciting the vital activity of the intestinal epethelium and thus determining the absorption of digested material, moistening the intestinal wall, lubricating the colon, and last, and most important, preventing decomposition, and thereby preventing auto-intoxication. As a consequence of the bile not fulfiling its many offices, fermentation is rapidly excited within the bowel, producing many delederious products, which pass through the the entero-hepatic circulation and reach the liver, thus increasing the work of an already overtaxed organ. "This, together with the damaging effects of the original poison and imperfect oxidation, explains the chief factors in the development of increased bodily heat in connection with all diseased conditions. In this manner the process continues repeating its injurious effects upon the system, until nature, by her inherent power, grants relief by destroying or eliminating the poisons, or is aided in so doing by the skilful administration of some medical agent." In a certain percentage of cases, however, both the inherent power of nature and the skill of the physician are held in abeyance.

"By converting all the food-stuffs into a thoroughly and easily diffusible fluid, by decreasing to the minimum the products of intestinal fermentation, and by stimulating the activity of the gut, we have produced a condition which favors the most rapid absorption attainable, with the least expenditure of force, and, as a result, there is carried to the liver and system at large a completely digested intestinal product — a nutritive pabulum which contains the smallest possible amount of effete or deleterious matter."

This is of vital moment: for there exists a certain relation between the imperfect workings of the vital forces, and disease. If the organism ingest food ill-suited for its needs, functional derangement will soon occur. Thus, it has come to be recognized by most physiologists and pathologists, that many of our chronic diseases which occur largely in late life are the result of a state of malnutrition and a consequent long-continued physiological derangement — rather than of an inherited vice. This functional perversion is largely due to the habit of feeding the growing child on a diet composed mainly of the starches and sugars. It is a most common sight to see our children eating freely of the confectioner's goods, and as they grow older desiring the rich pastries, marmalades, etc., until an almost passionate and insatiate fondness for this non-nutritious and highly stimulating diet is induced and they soon prefer this kind of food to the plain, nutritious nitrogenous compounds.

This stimulation soon fails to uphold the buoyancy of spirit and apparent good health, and a condition is left which becomes a great deteriorating factor.

When these individuals attempt to accomplish great physical or mental tasks, there is noticed a greater and more rapid expenditure of vital force than nature intended. The demand on the part of the system for a strong stimulant is not fully met by the sugars ($C_6H_{12}O_6$); and the more active C_2H_6O (alcohol) is called into requisition. Thus future habits of intemperance often have their origin in this simple cause.

You may ask, Is not a liking for strong drink inherited? We answer, No! But a weakened system craving for something to stimulate it is, and if not corrected by a non-stimulating nitrogenous diet in youth, those who fail through ignorance or otherwise must be held responsible.

All of these factors leave the system in a much lowered condition and offer an organism which is a good pabulum for disease-germs and poisons of all kinds, and incapable of withstanding their inroads. One has but to call to mind the number of cases of tuberculosis following a continued state of malnutrition; indeed, this lowered bodily tone is one of its chief etiological factors.

There are two great collections of forces, therefore, which attempt to keep the body in a healthy condition. If you have a derangement of either intestines or liver you will certainly have disease following its continuance. If you have a condition of suboxidation of the proteid food-principles you may expect certain diseases which are caused by the retention in the body of the products of such an abnormal condition.

Let us glance very briefly at some of the diseases depending upon the antagonizing power of the intestines and liver being below normal. We place cholera among the first. It was found during the recent plague of this disease in St. Petersburg and Hamburg that the cholera attacked those who had acute intestinal complaints and chronic gastric or intestinal indigestion, who ate food poor in quality, i.e., coarse, badly cooked, or partially decomposed meats, fruits over or under ripe, or who were addicted to the use of alcohol. The greatest mortality was among those whose habits of life in eating or otherwise produced or had a tendency to produce a diminished vitality. Cholera, to the one whose liver and intestines are in a normal condition and who eats wholesome and proper food, is not a disease to be dreaded.

Typhus fever but rarely attacks the healthy subject, but is very fatal to those who, by reason of fatigue, starvation, or other conditions, are below the requisite standard of health.

Typhoid fever is the same. In the healthy body the chances

of the peculiar germ living and producing harmful effects is very small. This broad statement is applicable to all kinds of infectious intestinal disease.

Very interesting is the study of tuberculosis. According to the latest authorities, consumption is dependent upon three factors: First, decreased vitality, antagonizing powers, or what you will. This we have spoken of, and in what manner it is induced or transmitted. Second, an active inflamatory condition. This may be pneumonia, bronchitis, laryngitis, or the like. Third, the presence of the bacillus tuberculosis. Without these three there can be no consumption. It is the usual thing, in the examination in the dead-house, to find evidences in the lungs that the subject had at some time a commencing consumption, but the vitality had been so great that nature had encapsulated the infected part with tissue of high vitality and the condition became inocuous. The fatality from tuberculosis, then, is dependent on a decreased vitality, and we must look to a proper kind of diet and a consequent increase in the general antagonizing power of the body for the remedy.

Those diseases dependent on or induced by suboxidation are very many. A few only will be mentioned by way of illustration. If we take a proteid molecule ($C_{72}H_{112}N_{18}O_{22}S$) and attack it by 139 molecules of oxygen we will have the normal oxidation and the usual excretory products given off, namely, urea, uric acid, kreatinine, carbon dioxide, water, and a molecule of sulphuric acid appearing as a sulphate. If attacked by 136 oxygens only we have the same but with an increase in the amount of uric acid. At this stage we have a condition present which is at the bottom, probably, of more diseases than any other. So that we consider the presence of an abnormal quantity of this acid in the renal excretion to show a condition of suboxidation of the nitrogenous elements of the food-stuffs. Had the nutritive compounds been completely transformed within the system they would have been eliminated as urea — a compound very soluble and easily handled by the organism in proper amounts. But such not being the case we find that the failure in its elimination gives us many diseases. People who have this condition are greatly disposed, by the antecedents or isomers of this acid in the tissues, to congestive conditions of all the structures where such compounds exist, but more especially the naso-pharyngeal mucous membrane and the intramuscular planes. They suffer from dyspepsia, functional disturbance of the liver, palpitation of and peculiar feelings about the heart, bronchial affections, often iritis, eczema, and a number of peculiar symptoms generally known by the obscure term, neurasthenia. They are most sensitive to changes in temperature and atmospheric density, declaring they cannot live in certain localities, and, in fact, suffer from general bodily derangement. We look at uricæmia in this wider and more general way and recognize its influence in connection with many of the vague abnormalities of childhood. Some observers have found as high as 30 per cent of the children — especially those confined at school — troubled with neurasthenic and other incomplete expressions of defective metabolic action. A very large percentage of the nervousness and ill-health of young women has this condition as one of their chief ætiological factors.

In an article on the "Pathology and Rational Treatment of the Uric Acid Condition," in Merck's Bulletin of last year, it was shown that the prevalence of uricæmia was very great and because of the almost universal habit of partaking of food whose nature as a nutrient compound is bad and whose quantity far exceeds the physiological demands, especially during early youth, some degree of uricæmia under twenty years is almost the general rule. Let us look at the frequency of uric-acid calculi and the age when they most frequently occur. From a large number of cases of calculi found in the bladder by English observers, 83 per cent were of uric acid. In America the percentage is about 78. If we take the cases of Civiale, Coulson, and Thompson, numbering in all 10,467, we find that 6,524 or 62⅓ per cent were under twenty years of age. In the statistics of 8,574 cases in this country, 4,986 or 58 per cent were under twenty.

Returning to the same method of investigation, we find that if only 129 oxygen elements are used we have the condition known as oxaluria. If we fall still further below the normal and have but 94 elements of oxygen to attack the proteid we have lactic acid formed, and rheumatism, neuralgia and the like as the result. If we have but 76 elements to attack the proteid molecules, we have as one of the products of incomplete metamorphosis glucose, and thus either temporary or permanent diabetes.

Has not enough been said to show that suboxidation is a dangerous if not fatal condition? Why should we multiply difficult chemical explanations for known clinical and every-day facts?

Bright's diseases are probably more often caused by the same condition than any other. You really call upon the kidneys to do more work than normally in taking care of increased quantities of refuse matter because of the large quantity of food ingested and at the same time place it upon decreased nutrition. The result is, you have first a functional derangement which it is possible to disperse, and then an organic condition which it is impossible to remedy. Those who understand the science of proper feeding and apply that which they know to their cases of Bright's get results satisfactory both to their patients and themselves, otherwise their patients inevitably get worse and die early.

The accumulation of fat in the tissues, or obesity, is a pathological or diseased condition. All the fat that is added to the body above five per cent of the total bodily weight is usually the result of an abnormal physiological condition of the nutritive system. Obesity is the result of an incomplete oxidation of the proteids with the formation of fat as one of the by-products resulting from an imperfect metabolism of such bodies. This is substantiated by fully recognized chemical laws. It is Professor W. H. Porter who says that "while this abnormal amount of adipose tissue may perhaps to the ordinary eye beautify the macroscopic appearance of the individual, it is no guarantee of a sounder constitution or a higher vitality in the microscopic and chemical construction of the bodily tissues, generally it indicates the reverse or that a pathological condition is hidden beneath this superficial beauty."

We have not spoken of a large number of diseases in which an incorrect diet is an important factor in their continuance, space will not allow; enough has been said, however, to call attention to certain facts of great importance. First, we should understand which kind of diet is the best suited to furnish to the body the elements which it requires daily; second, the constituents of the diet should be such as will give nourishment to the body and use but a minimum of vital force in its preparation; third, the quantity ingested daily should be such as will maintain an equilibrium between production and destruction, this is determined by a study of the renal excretion; fourth, auto-intoxication by products of decomposition and fermentation in the intestines is prevented by the application of the above facts; fifth, entrance of deleterious agents into the entero-hepatic circulation is prevented by preventing hepatic derangement; sixth, suboxidation is a dangerous condition, and has as its sequelæ a definite line of disease processes.

In conclusion, we desire to impress upon the mind that there exists a very intimate relation between imperfect alimentation and organic or functional derangement, and that as we are understanding more about diet and the proper food principles forming it each year, we appreciate its enormous importance.

We are rewarded when supplying a scientific course of diet and regulating the same by a conscientious study of the renal excretion, by seeing abnormal processes of the body give place to normal, acute diseases decrease in mortality, convalescence speedy and complete, and chronic conditions ameliorated, and comfort replacing pain and annoyance.

SNOW-ROLLERS.

BY DR. E. W. CLAYPOLE, AKRON, OHIO.

IN the early part of last year I received from a former student a letter telling me that in the place where he is now residing (Milledgeville, Fayette County, O.) a very curious phenomenon had been observed. After a light fall of snow the ground was strewn with small balls, light and fragile, the like of which no one could recollect having previously seen.

Recognizing from his letter that he was writing of a case of the formation of the rather rare "snow-rollers," I wrote immediately requesting details, and received in reply the following letter: —

MILLEDGEVILLE, O., Feb. 7, 1892.

PROFESSOR E. W. CLAYPOLE.

Dear Sir: On the morning of Jan. 30, 1892, a curious phenomenon was witnessed here — snow-rollers — of which I send account. I found it difficult to obtain trustworthy information as regards extent of area. None of the city papers spoke of that, and only quoted from local county papers, the correspondents of which furnished all that I saw regarding the occurrence. The rollers may have extended over a very large area in southern Ohio. They were formed in the streets of Wilmington, in Clinton County, though they are not mentioned in the adjoining country. Wilmington is twenty miles from here. No one residing a mile from here, in any direction, with whom I have spoken, witnessed the phenomenon.

People here are divided in opinion whether they fell or were formed by rolling. Our local editors alluded to their correspondents who spoke of the balls as bearers of "fish-stories," refusing to believe them.

The morning of Jan. 30, 1892, presented in this vicinity a phenomenon of nature as striking as it is rare. The surrounding clean, level fields were covered with balls of snow, varying in size from three to five inches long and from one to two inches wide. Wheat-fields and meadows abounded with these balls, and suggested, at first sight, that a troop of school-boys had been having a battle with the snow.

Two fields, of thirty acres each, that came under my observation (one a new-sown wheat-field and the other a meadow) were literally covered with these "snow-rollers," there being at least 500 on the acre. Roadsides and lots contained a few, and, what is remarkable in this connection, I noticed them on housetops and straw-ricks.

On close investigation, I found the balls to be uniformly light and fragile, so that to lift one and preserve its form was impossible. Some were oblong, some almost spherical, while others resembled a tea-cup or small bowl.

There were no tracks behind them, or, if these had been made, the falling snow had obliterated them.

The accompanying weather conditions were as follows: The ground had been covered with snow for three weeks. A crust had formed on the top, thick and firm enough in places to bear up a person. This thawed a little during the afternoon of the 29th. The ensuing night was warm, the mercury registering 40° F. By ten o'clock a brisk wind was blowing, which increased in velocity, and soon the snow began to fall in large, moist flakes. The morning showed that about a half-inch had fallen on the crust, and on this lay the balls.

The phenomenon was reported from several places in this vicinity, chiefly in Fayette County, and from Clinton County, which adjoins it on the west, but nowhere did the rollers extend uninterruptedly over any great area. W. S. FORD.

In reply to a later enquiry, Mr. Ford informed me that no one took a photograph of this interesting occurrence. This is much to be regretted, as I am not aware that a view of any kind is in existence showing these snow-rollers. The chance of obtaining a unique negative was lost.

I cannot say if the phenomenon here described is really so rare as the scarcity of published accounts would lead us to infer. Perhaps the publication of this note may lead to clearer knowledge on this point.

Not having access to the earlier scientific literature on the subject, I am able to quote only a few instances of snow-rollers. Several years ago there was a short correspondence in the columns of *Nature*, from which I condense the following statements.

In the issue of March 29, 1883, Mr. G. J. Symons wrote that he believed that the first recorded account of the phenomenon appeared in an early number of the Philosophical Transactions, from the pen of Dr. Clouston of Sandwich Manse, in the Orkney Islands.

Mr. Symons adds that he has heard of but one case in England. This was reported by Admiral W. F. Grey in the *Meteorological Magazine* for May, 1876. It occurred on his lawn in the south-east of England, and the balls or rollers varied from the size of an ordinary snow-ball to that of a cubic foot, and each one left a decided track to the leeward. In this case they were seen to form in the evening.

The correspondence above quoted was called out by a letter from Mr. S. Hart of Trinity College, Hartford, Conn., to the editor of *Nature*, mentioning that on Tuesday evening, Feb. 22, 1883, a light, damp snow fell on the crust that had formed over the earlier snowfall, and that a brisk wind sprang up after midnight. Next morning on the college campus and in the adjoining park and empty lots numbers of natural snow-balls, spherical and cylindrical, from twelve to eighteen inches in diameter, and hollow at both ends, were strewn over the ground. Behind them were visible to leeward tracks 25 or 30 feet long in the new-fallen snow. The rollers were so light and fragile that handling was impossible. A few of them could be traced 60 feet and some had even been rolled up hill. They were especially fine on the frozen Connecticut River.

The same writer also reports a similar occurrence in New Jersey in 1808, when the rollers were seen to form in the day-time, and extended over at least 400 square miles of country.

In a subsequent letter, printed in the number of *Nature* for March 6, 1884, Mr. Hart returns to the subject and reports a repetition of the phenomenon in Oneida and Herkimer Counties, in New York, on Tuesday, Jan. 22, 1884, adding that the rollers were of the same size as in the former case, but were in some instances firm enough to be picked up and handled without crumbling. This is, so far as I know, the only occurrence in which this has been reported possible.

The wide experience of Mr. Symons is sufficient ground for assuming that the formation of snow-rollers is not frequent in Great Britain, and the scarcity of records here leads to a similar conclusion for this country. Further reports on the subject are desirable.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

Some Detailed Evidence of an Ice-Age Man in Eastern America.

MR. HOLMES'S statement in his communication to *Science* for Jan. 20, that "If there was, as is claimed, an ice-age man or at any rate a palæolithic man in eastern America, the evidence so far collected in support of these propositions is so unsatisfactory and in such a state of utter chaos that the investigation must practically begin anew," should not be allowed to go unchallenged. I will content myself, however, by giving the details in a single case, namely, those concerning the implement which was found in 1889 by Mr. W. C. Mills at Newcomerstown, Ohio, and which is now in the collection of the Western Reserve Historical Society in Cleveland.

Though the discovery was made in October, 1889, it was not brought to public notice until the next spring, when I chanced to meet Mr. Mills and learned about it. He then forwarded it to me, when its exact resemblance in form and finishing to an implement which I have in my own collection, that was obtained by Dr. Evans of London at Amiens, France, greatly impressed me. I forwarded it immediately to Professor H. W. Haynes of Boston, whose expert judgment is second to that of no other person in America, or indeed of the world. Professor Haynes exhibited it at the meeting of the Boston Society of Natural History on May 7, 1890, and his account was published in the Proceedings of that evening. In conclusion, after having enumerated its distinctive characteristics, he said, "I desire to express most emphatically my belief in the genuineness and age of this Newcomerstown implement, as well as to call attention to the close re-

semblance in all particulars which it bears to those unquestioned palæolithic implements [which he exhibited beside it] of the Old World." This implement is not a "reject," but is a finished implement, with the secondary chippings all around the edge. The cuts, reproduced from photographs, on pages 252 and 253 of my volume on "Man and the Glacial Period," perfect as they are, by no means do the implement justice.

I promptly gave an account of this discovery in *The Nation* in its issue for April, 24, 1890, and repeated it in substance with some additional particulars on page 620 of the third edition of my volume on "The Ice Age in North America." The account in my later volume is still more condensed. The detailed evidence is published in Tract No. 75 of the Western Reserve Historical Society, Cleveland, Ohio, which contains the report of the meeting when Mr. Mills was present and gave his own testimony. This was held Dec. 12, 1890.

The facts are these: There is a glacial gravel terrace in Newcomerstown at the mouth of Buckhorn Creek, where it enters the larger valley of the Tuscarawas River. There can be no question about the glacial age of this terrace. It is continuous up the river to the terminal moraine. Its surface is about 35 feet above the flood-plain of the Tuscarawas; it consists of stratified material, containing many granitic pebbles and much granitic gravel. The deposit at Newcomerstown extends over many acres, having been protected from erosion in the recess at the mouth of Buckhorn Creek. Through the middle of this deposit the railroad has cut its road-bed, and for years had been appropriating the gravel for ballast.

Mr. Mills is an educated business man, who had been a pupil in geology of Professor Orton of the State University, and had with him done considerable field-work in geology. Mr. Mills's character and reputation are entirely above suspicion. In addition to his business he took a laudable interest in the collection of Indian relics, and had in his office thousands of flint implements, collected by him and his associates in the vicinity, who had been organized into an archæological society. His office was but a few yards' distant from the gravel pit from which I have said the railroad had been for so many years obtaining ballast. The perpendicular face of this bank of gravel as it was exposed from time to time by the excavations of the railroad men was frequently examined by Mr. Mills, not with special reference to finding implements, for that thought had not entered his mind, but for the sake of obtaining specimens of coral, which occasionally occurred in the gravel. While engaged in one of these rounds on the 27th of October, 1889, he found this specimen projecting from a fresh exposure of the perpendicular bank, 15 feet below the surface, and, according to his custom, recorded the facts at the time in his note-book. There was no lack of discrimination in his observations, or of distinctness in his memory. There is no possibility of any doubt about the undisturbed character of the gravel from which Mr. Mills took the implement with his own hands. The photograph of the bank, to which I refer in my volume, is not, as I say, of the same one from which this implement was taken, but it is so like it that it illustrates the character of the problem just as well. I will, however, speedily prepare an illustration from photographs of the terrace at Newcomerstown.

These facts, submitted at the meeting of the Western Reserve Historical Society referred to, were fully detailed upon the spot to myself and a party of gentlemen, consisting of Judge C. C. Baldwin, E. A. Angell, Esq., Wm. Cushing, Esq., all lawyers of eminence, and Mr. David Baldwin, who accompanied me in a visit to the place on the 11th of April, 1890. We had all the opportunity to question and cross-question that could be desired. Now this is only one case, but it comes in as cumulative evidence with other cases; that of Dr. Metz of Madisonville being almost equally good. I will only make a further passing reference to the evidence at Trenton. Dr. Abbott is not the only competent person who has discovered implements at Trenton in undisturbed gravel. In addition to those mentioned in my communication for Nov. 11, Mr. Lucien Carr has specifically stated in two different meetings of the Boston Society of Natural History (see their Proceedings for Jan. 19, 1881) that he, in company with Professor J. D. Whitney, found several implements at Trenton, one of which was in place "under such circumstances that it must have been deposited at the time the containing bed was laid down."

I submit that this evidence is neither "chaotic" or "unsatisfactory," but is as specific and definite and as worthy to be believed as almost anything any expert in this country, or any country, can be expected to produce. If the public cannot be convinced by such evidence, it is doubtful if any expert will be able to convince them. "If they believe not Moses and the prophets, neither will they believe, though one rise from the dead."

No one will have any objections to Mr. Holmes beginning the investigations anew, but many will object if, when he makes discoveries of relics of man in glacial deposits, he shall claim that they are the first discoveries of the kind which have been made in America.

G. FREDERICK WRIGHT.

Oberlin, O., Jan. 27.

Palæolithic Man in North America.

IF the weight of opinion may be considered as having settled any question, the fact that in some part of the world man once existed in so low a stage of culture as to have possessed only implements rudely chipped out of stone may be regarded as established. If this so-called "palæolithic man" existed anywhere else, why may we not suppose that he has lived on this continent also? To hold the contrary is to imply that this part of the world was not peopled until mankind had developed into the neolithic stage of culture. With such an *a priori* probability, therefore, of finding proofs of his existence here as well as elsewhere archæologists have applied themselves to the task of searching for such evidence in this country. But when archæologists make use of the term "implements rudely chipped out of stone," they have in mind certain well-known and perfectly defined objects. They do not mean pebbles showing the marks where certain portions have been casually detached by blows. By the term "palæolithic implement" the instructed archæologist intends certain definite and fixed types of chopping or cutting utensils, which have been found in large quantities, more especially in western Europe, both in gravel beds of ancient quaternary rivers and sealed up in caverns by overlying layers of stalagmite. These chipped implements have a *facies*, or family likeness, that is unmistakable, and they are accompanied by the remains of certain extinct animals, which furnish a guarantee of their great antiquity. They are implements perfect, complete, and finished in themselves, and not merely objects rudely blocked out to a general outline of the shape intended to be given to them by subsequent toil. They are entirely unlike those rude beginnings of implements which were intended to be perfected by being ground down to a polished surface. Such unfinished articles are quite as common as the polished stone axes themselves, both in Europe and in this country, but no competent archæologist would ever confound one with the other. The general appearance of a series of palæolithic implements and of a set of unfinished, chipped, neolithic implements is entirely different. Thus the term "palæolithic implement" has become a perfectly established technical term, and archæologists, understanding well its full meaning, have accordingly sought for examples of it in the river-gravels of North America. They have confidently asserted that they have found such, not in large quantities, it is true, but sufficiently to establish the fact that palæolithic man lived here also, as well as in Europe, Asia, and Africa.

But quite recently there has been put forth by a little knot of men, principally connected with the U. S. Geological Survey, the claim that this conclusion is entirely wrong; that no palæolithic implement has ever been discovered in this country, and that those objects which are claimed to be such are merely "rejects," or imperfect or unfinished articles left behind by the natives who were found in possession of this continent, and who were then living in "the age of polished stone."

"With that half-wisdom half-experience gives" these geologists, whose archæological studies have been limited to our native Indian tribes and their remains, have had the assurance to maintain that the so-called "palæolithics" of this country are nothing more or less than what are sometimes styled "turtle-backs," or those unfinished polished celts, one of whose sides has had less

material detached from it than the other. This is the whole question in a nut shell; certain Washington geologists claim to know everything about palæolithic man, and that those who disagree with them are utterly ignorant of the subject. But they have put forward this preposterous claim in the most offensive and contemptuous manner possible, using language in regard to those who differ from them such as no gentleman would employ, and wrapping up their conceited ignorance in a cloud of fustian, which appears to pass for philosophical writing in the atmosphere which surrounds them. That this style of "argument" is confined to a very limited circle would seem to show either that the word of command has been given out from some autocratic source, which they dare not disobey, or that they are actuated by jealousy at the success that has crowned the labors of those who maintain the existence of palæolithic man in North America.

Only a jury of the acknowledged pre-historic archæologists of the world is competent to pronounce judgment upon this question.

HENRY W. HAYNES.

Boston, Mass., Jan. 24.

Criticism of the U. S. Geological Survey.

THE frequent complimentary notices and encomiums upon the U. S. Geological Survey that have appeared in *Science* without any adverse criticisms, might lead one not conversant with the subject to suppose that the Survey reflects the geological learning of this country, or that it is rapidly discovering the resources, or in some other way is giving *quid pro quo* for the money expended.

Looking upon the Survey as a public matter, it is a proper subject of criticism, by any citizen, and among those who have given it any attention, with whom I converse or correspond, not one expresses satisfaction, and generally they have only words of severe condemnation.

The Director has called special attention to it by his article in *Science* of Jan. 13, and stated his claims for the work accomplished. He says:

"When the bureau was instituted, in 1879, it was found at the outset that there were no adequate maps of the regions selected for survey; and it soon became evident that the geologic work could not be carried on without maps showing the relief of the land as well as the hydrography and culture. Accordingly, topographic surveys were instituted in each of the regions selected for examination. At first these surveys were planned to meet immediate needs, and the methods of mapping were not systemized or unified; the scales were diverse and the methods various; the areas were selected by geologic needs and were not fitted to a general scheme for the geologic map of the country, and the resulting maps were discordant in their conventions. At this stage the topographic surveys were executed under the direction of the chiefs of the geologic divisions. After two or three years of trial this form of organization was found unsatisfactory, and the topographic surveys were separated from the geologic work and assigned to a geographic division, which has ever since been maintained."

In short, he says, at the outset, it soon became evident that the geological work could not be carried on without maps made by a topographical survey and accordingly the topographical surveys were instituted, but after two or three years of trial this form of organization was found unsatisfactory, and the topographical surveys were separated from the geological work. I will agree with him that, for the first two or three years, "the methods of mapping were not systemized or unified," and I am willing to believe they were of little or no geological value, and I am willing to agree that after two or three years of experience and study he ascertained that a topographical survey belongs to geographical work; but there are two matters arising from his statement that are not exactly clear, viz.:

1. If it was evident, at the outset, that geological work could not be carried on without a topographical survey, why was it necessary, within two or three years, to separate the topographical surveys from the geological work?

2. Was there, at the outset, any intelligent geologist or geographer, in the United States, not connected with the U. S. Survey, who did not know that topographical surveys belong to geographical work?

We do not desire any play on words and, therefore, come at once to the question, What geological work has been done by the Survey that is of any general benefit to the science, or that is of any economical value, or that is of any general application to the stratified rocks of the continent? For my part, having examined nine of the Annual Reports, and observed nothing of general scientific value or utility (excluding a few definitions of fossils), I would answer this question negatively. And if there is work that might possess some geological value as a preliminary reconnoissance, such work is more than destroyed by inexcusable provisional names for the groups, without characterizing them or stating the fossils by which alone their places in the geological column are to be determined. (I do not use the word "group" in the sense in which it is used, generally, in the survey, but I use it in its established geological sense.)

A lawyer in any State can go into any court in any other State or into any of the courts of the United States or into those of Canada or England and hear and understand the technical words of the science. No word will be used by any judge or attorney with which he is not familiar and it will be used in the exact legal sense in which he learned it and used it at home. More law books have been published than belong to all the sciences of natural history combined, but no one in centuries has proposed a substitute or provisional word for any technical one in use, though it cannot be denied that more expressive or euphonious words might, in some instances, be proposed. Blackstone made his fame by abstracting the technical definitions from the opinions of the courts, as written in the books, with full references and citations to his authorities, and it is for that reason alone that the use of his commentaries can be justified in any law school in this country. The whole value of precedents and court reports is in the fixity of the technical words used and their established definitions. What the science of geology demands is fixity in the names of the subdivisions of the stratified rocks, and the accurate determination of the fossils that characterize each subdivision, for by the fossils alone can the subdivisions be determined. And these demands have been wholly disregarded and set aside by the U. S. Survey since 1879, and we have synonym after synonym for equivalent rocks, vague and worthless definitions, and what seems to me the culmination of absurdity if not crime against the progress of geological knowledge, the pretension that they are developing a "New Geology."

This matter of nomenclature alone, in my opinion, will everlastingly condemn the Survey, so far as it deals with stratigraphical geology, and make students of the science wish there had been some power to suppress the publication even if it was necessary to expend the appropriations. It would have been better to have given the money to the printer and consigned the stratigraphical manuscript to the flames.

But, aside from the questions of nomenclature, that are so intimately connected with learning, and so vital to the understanding of any subject, there are numerous fundamental errors. If any one will turn to page 372 of the Seventh Annual Report, under the head of "Paleontological Characters as a Basis for Classification," he may read pages in consecutive connection where every idea expressed will be recognized as absolutely erroneous by any competent paleontologist. I will quote only a single sentence. He says:

"We have now constantly to remember that paleontology is based wholly upon stratigraphy, and consequently that the conclusions that we would draw from our fossils must constantly be checked by stratigraphical observations."

This statement is made, in the face of the fact, that no species in the great Subkingdom Echinodermata is known to have a vertical range of 500 feet, in the palæozoic rocks of North America; that not one is known to cross the line subdividing the groups of rocks recognized in the Geological Surveys of New York, Pennsylvania, Illinois, Indiana, or Canada; and in the face of the fact, that science has not recognized a group of rocks within the

past twenty years, in America or elsewhere, except the subdivision was based on the fossil contents.

There is not space in a scientific journal to review the ponderous volumes of the Survey, but I do not discover any attempt to make a geological survey of the United States or of the Territories; but instead thereof, the volumes contain theoretical discussions about the glacial period, that have no economical value, and which period, I think, is fiction, and they contain a vast amount of extremely localized and temporary matter of no general utility. This is well illustrated in the Seventh Report now before me. One of the principle articles is entitled "The Geology of the Head of Chesapeake Bay." It covers more than one hundred pages, has sixteen plates and six additional illustrations. The author says:

"The investigation here recorded was made under the joint auspices of the U. S. Geological Survey and the U. S. Fish Commission, for the purpose of determining the probable success of an artesian boring at Fishing Battery station, off Spesutie Island, five miles south of Havre de Grace, Md., and near the head of Chesapeake Bay. The field-study occupied a portion of July, 1886."

The article is so free from geology and so extremely localized that I have been unable to discover the object in publishing it in the U. S. Geological Survey. The author, however, says, on page 564, under the head of "The Geologic Exposures":

"So variable are the different formations of the region in the several exposures that the differences exceed the resemblances, and, since the local diversities are due to local causes the characteristics of the formations cannot be elucidated by generalized description with sufficient minuteness for the purposes of the local student."

Another one of the principal articles, hugely illustrated, in the Seventh Report is entitled "Report on the Geology of Martha's Vineyard." I have lookod through it, in vain, to find an item of geological information. It would certainly take the cake in any walk where pretension and nothingness were to be the winners.

In conclusion, I am opposed to the continuation of the U. S. Geological Survey, under the present management, because, I think, it is not prosecuted in the interest of science but quite the contrary, and because the publications now hang, like a millstone, around the neck of progress, in the dissemination of geological information among the people. S. A. MILLER.

Cincinnati, Ohio, Jan. 23.

Monument to Hirn.

IN a letter, just received from Mon. G. Kern, President of the Commission established for the purpose of securing the erection of a monument to his late distinguished friend and colleague, Mon. G. A. Hirn, the great engineer-physicist and investigator, on account of which subscriptions have been received in considerable amounts, both in Europe and America, he writes as follows:—

"The monument proposed for Hirn, and of which the plans were made by Mon. Bartholdi, will consist of a bronze figure, seated, with pedestal, and will cost about 30,000 M. To complete the subscription, there still remains a balance of 10,000 M., and I have knocked at the doors of many friends and acquaintances of Hirn, finding welcome, in Paris and in Bordeaux; I anticipate full success."

It has been the hope of the gentlemen engaged in this enterprise that a fair proportion of the subscription might come from citizens of the United States of North America, among whom Mon. Hirn counted some personal friends, and many warm admirers. He was always peculiarly appreciative of such good will and such praise of his work as came to him from this side of the Atlantic. Those who desire the privilege of contributing may send their drafts on Paris to the "Comité-Hirn," I Obstmarkt, Marché aux Fruits, I, Colmar, Alsace.

Very respectfully yours,
R. H. THURSTON.

Ithica, N. Y., Jan. 25, 1893.

CALENDAR OF SOCIETIES.

Society of Natural History, Boston.

Feb. 1.—H. L. Harris, A New Instance of the Capture of Streams; W. T. Sedgwick, The Natural History of Disease.

Publications Received at Editor's Office.

ANDERSON, W. Mineral Springs and Health Resorts of California. San Francisco, The Bancroft Co. 384 p. 8°.

BEECHER, H. W. Bible Studies. Edited by J. R. Howard. New York, Fords, Howard & Hurlbert. 438 p. 12°. $1.50.

DANA, EDWARD SALISBURY. Catalogue of American Localities of Minerals. New York, Wiley. 51 p. 8°. $1.

DE MOTTE, J. B The Secret of Character Building. Chicago, S. C. Griggs & Co. 130 p. 12°. $1.

DREYSPRING, A. French Reader on the Cumulative Method. New York, Amer. Book Co. 171 p. 12°. 75 cents.

HOLMAN, SILAS W. Discussion of the Precision of Measurements. New York, Wiley. 176 p. 8°. $2.

HOREY, HENRY T. Theory of Structures and Strength of Materials. New York, Wiley. 817 p. 8°. $7.50.

HUTCHINSON, H. N. Extinct Monsters. New York, Appleton. 254 p, 8°.

PARSHALL, N. C. Proofs of Evolution. 5th 1000. Chicago, Chas. H. Kerr & Co. 70. p. 12°.

PEET, S. D. The Mound Builders: Their Works and Relics. Chicago, The American Antiquarian. 376 p. 8°.

SHALER, N. S. The Interpretation of Nature. Boston, Houghton, Mifflin & Co. 305 p. 12°. $1.25.

STYX. Hermetic Philosophy. Vol. III. Can Virtue and Science be taught? Philadelphia, Lippincott. 221 p. 12°. $1.25.

SYKES, JOHN F. J. Public Health Problems. New York, Scribner. 370 p. 12°. $1.25.

THE SONG BUDGET, The Song Century, The Song Patriot. Syracuse, C. W. Bardeen. 12°. 50 cents.

WEYL, THEO. The Coal-Tar Colors. A Sanitary and Medico-Legal Investigation. Preface by Professor Sell. Tr. by H. Leffmann. Philadelphia, Blakiston. 154 p. 8°. $1.50.

WHITBY, BEATRICE. In the Suntime of Her Youth. New York, Appleton. 365 p. 12°. 50 cents. Paper.

"Breathing Wells" in Missouri.

I WOULD like to refer those interested in the subject recently presented in your columns (Dec. 16 and Jan. 13) to notes on such wells in Nebraska, published in the *American Naturalist*, April and May, 1883. The conclusions there presented harmonize with those demonstrated by Mr. Willard and Professor Sweezy.

The tendency of such wells to freeze was first brought to my knowledge in connection with some that occur near Mt. Leonard and Marshall, in Saline County, Missouri. They are frequent in what I take to be an ancient channel of the Missouri River, which has become filled, largely with sand. I was assured by several persons directly acquainted with the facts, one of them experienced in putting in and repairing pumps, that in such "blowing wells" pumps not infrequently froze to the depth of 70 or 80 feet below the surface, and in one case ice had been found in a pump cylinder 100 feet down, which was about 10 feet above the water. In all these cases the reservoir of confined air is in an extensive deposit of dry sand connecting with the outer air through the mouth of the well. J. E. TODD.

Vermillion, S.D., Jan. 24.

BOOK-REVIEWS.

People of Finland in Archaic Times. Compiled by J. C. BROWN, LL.D. London, Kegan Paul, Trench, Trubner, & Co. 290 p. 8°.

BR. BROWN has in view the compilation of a series of volumes on the ethnography of northern Europe, prepared for popular study, of which this is the first. It is principally composed of extracts and abstracts from the Finnish national epic, the Kalevala, and some additional material is obtained from other sources. The whole forms an excellent popular introduction to the study of this ancient and remarkable poem, and enables the reader to understand the cultural condition of the people among whom it originated.

Dr. Brown is inclined to assign the date of the construction of the poem in its present form to about 1100 A.D. Doubtless, however, a great part of it is many centuries older, and the myths and legends which it embodies are referable to an ancient, prehistoric period, before the separation of the western Ugrian stock into its various existing branches.

AMONG THE PUBLISHERS.

"HIGHWAYS and Byways of Europe" is the title of a volume translated from the French of M. Jules Michelet by Mrs. Mary J. Serrano and published by the Cassell Publishing Company.

— Miss Kate Marsden's book, "On Sledge and Horseback to the Outcast Siberian Lepers," the Cassell Publishing Company will soon have ready. Ever since Miss Marsden began her work among the outcast lepers of Siberia the world has been ready to read her own story of her adventures and experiences.

— "The Principles of Rank among Animals," by Professor Henry Webster Parker, is the title of a paper read before the Victoria Institute, London, Dec. 5, 1892. It is a condensed digest, under eighteen heads of remark, of the recognized principles that determine grade, and with incidental reference under each to man's zoölogical position, but without touching the question of his origin. A distinction is emphasized by the author between anatomical and zoölogical position, as illustrated, for example, in the three sub-classes of birds, which are based far more upon mode of life than upon any morphological differences; also by the rank given to singing-birds as justified by the function far more than the anatomy of the syrinx. The ideal is still recognized in zoölogy, as in bird, fish, and insect; the ideal of man is the antithesis of that of anthropoids; and by nearly every principle of zoölogical rank he is shown to have a place quite apart, and in same respects less near to anthropoids than to animals lower in grade.

TO THOSE INTERESTED IN SCIENCE.

[Science (weekly) established in 1883, N. D. C. HODGES, 874 Broadway, New York City.]

Titles of Some Articles Published in *Science* since Jan. 1, 1892.

Aboriginal North American Tea.
Actinism.
Agriculture, Experimental, Status of.
Amenhotep, King, the tomb of.
Anatomy, The Teaching of, to Advanced Medical Students.
Anthropology, Current Notes on.
Architectural Exhibition in Brooklyn.
Arsenical Poisoning from Domestic Fabrics.
Artesian Wells in Iowa.
Astronomical Notes.
Bacteria, Some Uses of.
Bird on Its Nest, The.
Birds Breeding at Hanover, N. H.
Botanical Laboratory, A.
Botanists, American and Nomenclature.
Brain, A Few Characteristics of the Avian.
Bythoscopidæ and Cereopidæ.
Canada, Royal Society of.
Celts, The Question of the.
Chalicotherium, The Ancestry of.
Chemical Laboratory of the Case School.
Children, Growth of.
Collection of Objects Used in Worship.
Cornell, The Change at.
Deaf, Higher Education of the.
Diamonds in Meteorites.
Diphtheria, Tox-Albumin.
Dynamics, Fundamental Hypotheses of.
Electrical Engineer, The Technical Education of.
Eskimo Throwing Sticks.
Etymology of two Iroquoian Compound Stems.
Eye-Habits.
Eyes, Relations of the Motor Muscles of, to Certain Facial Expressions.
Family Traits, Persistency of.
Fishes, The Distribution of.
Fossils, Notice of New Gigantic.
Four-fold Space, Possibility of a Realization of.
Gems, Artificial, Detection of.
Glacial Phenomena in Northeastern New York.
Grasses, Homoptera Injurious to.
Great Lakes, Origin of the Basins of.
"Healing, Divine."
Hemipterous Mouth, Structure of the.
Hofmann, August Wilhelm von.
Hypnotism among the Lower Animals.
Hypnotism, Traumatic.
Indian occupation of New York.
Infant's Movements.
Influenza, Latest Details Concerning the Germs of.
Insects in Popular Dread in New Mexico.
Inventions in Foreign Countries, How to Protect.
Inventors and Manufacturers Association.
Iowa Academy of Sciences.
Jargon, The Chinook.
Jassidæ; Notes on Local.
Keller, Helen.
Klamath Nation, Linguistics.
Laboratory Training, Aims of.
Lewis H. Carvill, Work on the Glacial Phenomena.
Lightning, New Method of Protecting Buildings from.
Lion Breeding.
Lissajou's Curves, Apparatus for the Production of.
Maize Plant, Growth and Chemical Composition of.
Maya Codices, a Key to the Mystery of.
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